

**REMARKS**

**Status of the Claims**

Claims 1, 3-5 and 7-21 are pending. Claims 11-20 have been withdrawn from consideration.

In the present Amendment, claims 2 and 6 have been canceled herein without prejudice or disclaimer of the subject matter contained therein. Also, claims 1, 3, and 7-9 have been amended, and claim 21 has been added.

Support for the amendment to claim 1 can be found in Example 1 and Example 3. The remaining amendments are minor in character, and are not considered narrowing in scope. By deleting/amending these terms in order to clarify the claimed invention (e.g., changing the dependency of a claim), Applicants in no way are conceding any limitations with respect to the interpretation of the claims under the Doctrine of Equivalents. Support for new claim 21 can be found in Example 2 and Example 3, as well as in claims 1, 2, and 4. No new matter has been added.

Reconsideration of this application, as amended, is respectfully requested.

**Information Disclosure Citation**

Each of the Information Disclosure Statements filed by Applicant(s) to date has been considered by the Examiner, and initialed PTO-SB08 forms have been provided by the Examiner. Therefore, no outstanding issues remain with respect to the consideration of Information Disclosure Statements.

**Drawings**

Since no objection has been received, Applicants assume that the drawings are acceptable and that no further action is necessary. Confirmation thereof in the next Office Action is respectfully requested.

**Issues under 35 U.S.C. § 103(a)**

Claims 1-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over **Oh '866** (U.S. 2003/0118866) in view of **Zhou** (*Advanced Functional Materials*, No. 4, pp. 310-314 (2001)). This rejection is respectfully traversed.

A complete discussion of the Examiner's rejection is set forth in the Office Action, and is not being repeated here.

It is worth noting that the Examiner states that Oh '866 fails to disclose the instantly recited electron injecting layer adjacent to the cathode (negative electrode) side of the organic emitting layer (luminescent layer) as well as the conductivity of the hole injection layer (HIL) continuously changing along a thickness direction of the HIL as recited in pending claim 1 (see Office Action, page 3). Thus, Zhou is also cited to account for the mentioned second deficiency of Oh '866.

The objects of the present invention are to suppress the leak current of the organic EL element while improving the conductivity of the organic EL element and suppressing the operation voltage. In particular, suppression of the leak current of the organic EL element is attained by the hole injection layer having a border region with a reduced acceptor concentration formed in the vicinity of an interface between the hole injection layer and the

positive electrode, or the hole injection layer having a border region with a reduced acceptor concentration formed in the vicinity of an interface between the hole injection layer and the hole transport layer. As recited in pending claim 1 (and in claim 21), the conductivity of the hole injection layer continuously changes along a thickness direction of the hole injection layer (a feature not disclosed by the primary reference).

Even such advantages of the present invention have been experimentally confirmed. For instance, Applicants note the improved suppression of leak current of EXAMPLE 1 (see pages 10-11 of the present specification) and EXAMPLE 3 (see pages 12-14), which are 33.4  $\mu\text{A}$  and 18.1  $\mu\text{A}$ , respectively (see the table of Figure 5). Applicants further note the leak current of EXAMPLE 2 and EXAMPLE 3 are 82.2  $\mu\text{A}$  and 18.1  $\mu\text{A}$ , respectively (again, see Fig. 5). In contrast, COMPARATIVE EXAMPLE achieves a leak current value of 359  $\mu\text{A}$ . The COMPARATIVE EXAMPLE has a hole injection layer like the inventive examples, except the conductivity is substantially uniform within the layer (specification at page 13, last paragraph). Thus, the leak current of the present invention is drastically improved from the inferior leak current value of 359  $\mu\text{A}$  of the COMPARATIVE EXAMPLE.

M.P.E.P. § 2143 sets forth the guidelines in determining obviousness, wherein the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. The four *Graham* factors are: determining the scope and content of the prior art; ascertaining the differences between the prior art and the claims that are at issue; resolving the level of ordinary skill in the pertinent art; and evaluating any evidence of

secondary considerations. 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). Here, the *Graham* factors weigh in Applicants' favor.

First, regarding the *Graham* factor of ascertaining the differences between the prior art and the claims that are at issue, Oh '866 as a primary reference has major deficiencies as explained above. For instance, Oh '866 fails to disclose the instantly recited electron injecting layer adjacent to the cathode (negative electrode) side of the organic emitting layer (luminescent layer) as well as the conductivity of the HIL continuously changing along a thickness direction of the HIL.

While Zhou is cited as a secondary reference, and regarding the *Graham* factor of evaluating any evidence of secondary considerations (e.g., unexpected results), Applicants note the unexpected, superior results achieved by the present invention (i.e., EXAMPLES 1-3; see Fig. 5) versus an embodiment wherein the conductivity of the hole injection layer is uniform along a thickness direction of the hole injection layer (i.e., COMPARATIVE EXAMPLE). Applicants note that the primary reference does not even disclose the claimed conductivity of the hole injection layer continuously changing along a thickness direction of the hole injection layer. Thus, the three inventive EXAMPLES can be properly compared to the COMPARATIVE EXAMPLE.

Furthermore, although the cited secondary reference of Zhou mentions that the conductivity of the film increases with dopant concentration, Zhou completely fails to mention a leak current by controlling a border region with a reduced acceptor concentration as instantly claimed. Thus, Zhou is improperly cited and combined with Oh '866.

Accordingly, it would not be obvious for one of ordinary skill in the art to conceive of the present invention from the disclosures in Oh '866 and Zou. Further, these two references are improperly combined. In addition, unexpected results sufficiently any asserted *prima facie* case of obviousness. Reconsideration and withdrawal of this rejection are respectfully requested.

### **Conclusion**

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant(s) therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

In view of the above amendment, Applicant(s) believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez, Registration No. 48501 at the telephone number of the undersigned below to conduct an interview in an effort to expedite prosecution in connection with the present application.


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If necessary, the Director is hereby authorized to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

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Respectfully submitted,

By   
MaryAnne Armstrong, PhD  
Registration No.: 40069  
BIRCH, STEWART, KOLASCH & BIRCH, LLP  
8110 Gatehouse Road, Suite 100 East  
P.O. Box 747  
Falls Church, VA 22040-0747  
703-205-8000